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ABSTRACT

To test Tinto's theory of college attrition, a longitudinal study involving 766 students enrolled in Syracuse University in September 1975 was conducted to determine whether freshmen persisters and voluntary dropouts differed on certain attitudinal and behavioral measures of academic and social integration once selected background characteristics had been statistically controlled. Multiple regression was used to assess the relative importance of four sets of variables: pre-college characteristics; level of academic integration; level of social integration; and interactions between sex, major, and racial or ethnic origins and each of the social and academic integration variables. The results indicate that pre-college traits are not significantly related to attrition, but that the other three sets are, with the interactions explaining the largest proportion of the variance, followed by the academic and social integration sets in that order. These findings suggest that Tinto's theory may be conceptually useful in studying attrition, but also that certain revisions in the model may be needed. (Author/SPG)

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THE ROLE OF STUDENTS' BACKGROUNDS AND LEVELS OF ACADEMIC AND SOCIAL INTEGRATION IN COLLEGE ATTRITION: A TEST OF A MODEL*

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THE ROLE OF STUDENTS' BACKGROUNDS AND LEVELS OF ACADEMIC AND SOCIAL INTEGRATION IN COLLEGE ATTRITION: A TEST OF A MODEL

Abstract

In a test of Tinto's (1975) theory of college attrition, this study sought to determine if freshman persisters and voluntary dropouts at one institution differed on certain attitudinal and behavioral measures of academic and social integration once selected background characteristics had been statistically controlled.

Multiple regression was used to assess the relative importance of four sets of variables: pre-college characteristics; level of academic integration; level of social integration; and interactions between sex, major, and racial or ethnic origin and each of the social and academic integration variables. The results indicate that pre-college traits are not significantly related to attrition, but that the other three sets are, with the interactions explaining the largest proportion of the variance, followed by the academic and social integration sets in that order. These findings suggest that Tinto's theory may be conceptually useful in studying attrition, but also that certain revisions in the model may be needed.

THE ROLE OF STUDENTS' BACKGROUNDS AND LEVELS OF ACADEMIC AND SOCIAL INTEGRATION IN COLLEGE ATTRITION: A TEST OF A MODEL

As examination of the attrition research literature will reveal, the vast majority of such studies are primarily descriptive ones, identifying correlational relationships between attrition and a wide variety of demographic, sociological, psychological, and social psychological attributes of students, as well as various institutional characteristics. Far fewer studies, however, proceed from some conceptual statement of the relationships among these variables and students' decisions to withdraw or remain at any given institution.

Kamens (1971) theorizes (and reports evidence indicating) that larger institutions, with their various graduate and professional programs and broad networks of contacts with alumni in the business and professional communities, offer students greater opportunities than small institutions for entry into career and social positions outside the academic professions. Consequently, the larger schools presumably generate a stronger desire among students to remain and take advantage of these opportunities.

Rootman (1972) developed an interactional theory, positing that student-environment "fit" is based on the degree to which the student is socialized into the general academic and social fabric of an institution and on the degree to which his values and orientations are shared by his primary peer group. Cope and Hannah (1975) also view attrition as a function of the quality of the student-institution "fit."

The most comprehensive and explicit theories of attrition, however, have been advanced by Spady (1970, 1971) and Tinto (1975), both of whom view the degree to which the student is integrated into the social and academic systems of an institution, and the student's interaction with these systems, as the primary

determinants of persistence. Both of these theories specify a role for such antecedent attributes as a student's pre-college dispositions, interests, attitudes and skills, as well as the student's interaction with environmental characteristics of the institution he or she attends.

Spady's conceptualization of attrition lies principally in the domain of social integration, whereas Tinto asserts an approximate parity between the interacting influences of integration in both the social and academic systems of an institution.

According to Tinto:

> Given individual characteristics, prior experiences, and commitment, . . . it is the individual's integration into the academic and social systems of the college that most directly relates to his continuance in that college . . . . Other things being equal, the higher the degree of integration of the individual into the college system, the greater will be his commitment to the specific institution and to the goal of college completion (Tinto, 1975, p. 96).

Terenzini and Pascarella (1977) report a study which tentatively confirms the principal elements of Tinto's theory. They found that variable sets operationalizing the two concepts of social and academic integration could independently differentiate between stayers and voluntary leavers. They also report that academic and social integration variable sets appeared, as Tinto's theory specifies, approximately equally important.

Terenzini and Pascarella's (1977) study is limited, however, by the fact that their data were drawn from freshmen students in a single college of a large university, and the degree to which the relationships they observed might hold for students in other institutions is unknown. Second, their sample size was not sufficiently large to include students' background characteristics in the main analyses. Finally, and perhaps most important, their data were cross-sectional; consequently, there is no way of knowing whether the stayers and leavers differed at the time of matriculation on any of the variables employed in the main part of

their analyses. Post hoc comparisons of the two groups indicated no significant differences with respect to sex, academic aptitude, or pre-registration expectations of the institutional environment, but these analyses could not take into account any correlations among students' pre-registration characteristics, nor any correlations of those variables with measures subsequently adopted for their investigation.

The present study sought to test Tinto's model as comprehensively as possible. Specifically, three major research questions were addressed:

1. To what degree can certain pre-matriculation information on entering freshmen be used to predict voluntary attrition at or before the end of the freshmen year? That is, are certain students pre-disposed to drop out of a higher educational institution even before they enter it?
2. After controlling for any pre-matriculation differences between voluntary leavers and stayers, what are the relative independent contributions of variables operationalizing social and academic integration to the prediction of attrition? Put another way, are there behaviors and attitudes associated with the experience of college (after controlling for initial characteristics) which are related to voluntary attrition?
3. To what degree, if at all, is attrition a function of one or more interactions between sex, program of study, or racial or ethnic origin and the experience of college?

The present study is limited in several ways. It was conducted at a single institution and, as will be seen in the following section, the pre-registration data for this study do not include such potentially important predictors (as identified in the Tinto model) as students' social and economic attributes or pre-college commitment to obtaining a degree--variables which may influence subsequent patterns of social and academic integration and interaction.

METHODOLOGY

Design and Sample

The study was longitudinal and ex post facto and was done at Syracuse University, a large, private university in central New York with a total undergraduate enrollment of approximately 10,000 student (2,400 of whom were freshmen at the time of the study). In July, 1975, a simple random sample of 1,008 persons who had expressed their intention of enrolling in the fall as Syracuse freshmen were sent a questionnaire asking them to report their expectations of a variety of aspects of the college experience; usable responses were received from 766 students (76.0%) who subsequently enrolled. In late March of the following year (approximately two-thirds of the way through these students' second semester), a second questionnaire was mailed to these 766 students seeking information on their perceptions of the reality of their college experience. After a mail and telephone follow-up, usable responses were received from 528 freshmen (68.9%; 52.4% of the original sample). A review of each student's records in September, 1976 indicated that 90 of the 528 had voluntarily withdrawn from the university at the end of their freshman year; these 90 students are here identified as "leavers." Statistical tests indicate that the 528 respondents in this study are representative of the Syracuse freshman population with respect to sex, college of enrollment, and academic aptitude (based on Scholastic Aptitude Test scores).

While it might be reasonably argued that Tinto's longitudinal model is intended to explain attrition in the second, third, or fourth years of college, as well as in the first year, previous unpublished research at Syracuse University, as well as a number of published studies (Iffert, 1958; Eckland, 1964; Marsh, 1966; Rootman, 1972), strongly suggest that attrition is heaviest during, or at the end of, the freshman year. On the basis of this evidence, the authors judged that analyses based on freshman students would afford a reasonable and sufficient test of Tinto's model.

Variables and Instruments

If a student is fully integrated in the social and academic systems of an institution, then presumably that individual will have more positive perceptions of those two dimensions of the institutional environment and engage in certain types of behavior at a higher rate than will a less fully integrated student. Moreover, according to Tinto's model, a student's level of integration in the social and academic systems is presumably mediated by a number of background characteristics which the student brings to college.

The variables used in this study to measure pre-matriculation characteristics, and academic and social integration were as follows:

Pre-Matriculation Charateristics:

Sex
Racial/Ethnic Origin (non-minority or minority)
Major Program of Study (liberal arts or professional)
Academic Aptitude (combined Scholastic Aptitude Test (SAT) scores)
High School Achievement (rank in high school class divided by class size)
Personality (4 Activities Index Area scores; see text)
Mother's Education (six ordinal categories)
Father's Education (six ordinal categories)
Expectations of the Academic Program (on 4 dimensions of the Adjective Rating Scale (ARS); see text)
Expectations of Non-Academic Life (on 4 dimensions of the ARS; see text)
Expected Number of Informal Contacts with Faculty (per month, of ten minutes or more outside the classroom)
Expected Number of Extra-Curricular Activities (of two hours per week or more, on the average)

Academic Integration Set:

Perceptions of the Academic Program (on 4 ARS dimensions; see text)
Cumulative Grade-Point Average (on scale of 1-4, where 4 = A)
Intellectual Development Progress (one scale score; see text)

Social Integration Set:

Perceptions of Non-Academic Life (on 4 ARS dimensions; see text)
Actual Number of Informal Contacts with Faculty (total, of ten minutes or more, outside the classroom)
Actual Number of Extra-Curricular Activities Engaged In (two hours or more per week, on average)
Personal Development Progress (one scale score, see text)

Clearly, informal interaction with faculty may well influence both academic and social integration, and Tinto (1975) acknowledges this possibility (p. 109).

Nonetheless, he places interaction with faculty clearly within the social integration portion of his model (Tinto, 1975, p. 95), and for that reason, it was treated accordingly in this study

The design of the study (and Tinto's model) called for the measurement of students' pre-matriculation expectations (and, later, their perceptions of the "reality") of both their academic program and their non-academic life. As a measure of their expectations (and, perceptions) of their academic program, students were asked to rate the statement "I (expect/have found) my academic program at SU to be:" on the Adjective Rating Scale (ARS) (Kelly, Pascarella, Terenzini, and Chapman, 1975). The ARS was also used by respondents to rate the statement "I (expect/have found) my non-academic life at SU to be:".

The ARS consists of twenty-four adjectives (e.g., good, enjoyable, demanding, useless, interesting) against which the respondent rates certain statements using a four-point scale (1=Extremely, 2=Very, 3=Somewhat, and 4=Not at All). The internal consistency reliabilities of the scales derived from the five orthogonal factors of the ARS range from .71 to .85, and, over a seven-week period, test-retest reliability coefficients range from .66 to .98. Validational analysis indicates substantial correlations (r = .58 to .93) among the five ARS factors and the evaluation, potency and activity dimensions of the Semantic Differential (Kelly, et al., 1975).

The study also employed data from Stern's (1970) Activities Index (AI), a measure of personality needs. AI data were available on nearly three-quarters of the entering freshmen during the summer of 1975. This study used the four AI Area scores (Achievement Orientation, Dependency Needs, Emotional Expression, and Educability), which are second-order factors derived from the twelve first-order factors of the Activities Index. Kuder-Richardson Formula 20 reliabilities of the four Area scores are .96, 1.00, .96 and .96 respectively (Stern, 1970, p. 49).

The Intellectual and Personal Development Progress Scales, as will be discussed in the next section, are based on principal components analysis dimensions extracted from students' self-reported progress in eleven areas (using a four-point scale, where 4 = A Great Deal of Progress, through 1 = No Progress at All).

Data on the other variables, listed earlier, were collected on either the pre- or post-registration questionnaires or taken directly from students' admissions or academic records. Where a respondent had a missing data element, the mean value of the appropriate group (leaver or stayer) was assigned. Assignment of the group mean was limited almost exclusively to SAT and AI Area scores.

Analysis

Although the factor structure of the ARS was previously developed on a sample of 769 subjects, the stimulus statements to which subjects responded pertained to specific courses. In the present study, students were being asked to rate somewhat broader experiences (i.e., their academic program and their non-academic life). It was judged necessary, therefore, to determine empirically the factor structure which held for this somewhat different use of the ARS.

Thus, data analysis began with a principal components analysis of subjects' ARS "expectations" and "reality" responses. Separate analyses were done for each of the four statements (two pre-registration and two post-registration). Following Kaiser's (1959) criterion, components with eigenvalues greater than 1.0 were subjected to varimax rotation. An identical principal components analysis with varimax rotation was also performed on students' responses to the eleven, self-reported "progress" items. All rotated components will hereafter be referred to as factors.

As suggested by Armor (1974), mean factor scales were computed for each factor derived in the principal components analyses. A mean factor scale score for each respondent was developed on each factor by summing the raw scores on

variables with rotated loadings of .40 and above on a particular factor and dividing by the number of variables. Where a variable loaded above .40 but lower than .50 on two dimensions, it was dropped from the computation of factor scale scores (Armor, 1974).

The purpose of computing factor scale scores by using characteristic variables (rather than a complete estimation method, in which all variables are used, regardless of their factor loadings) was to increase the internal consistency (alpha) reliability of the individual factor scales (Armor, 1974). While such a procedure may result in the loss of orthogonality and lead to substantial inter-scale correlations, the authors judged that it would be preferable to optimize the internal consistency reliability of each scale despite the potential loss of orthogonality, since the latter situation can be dealt with effectively by employing multivariate procedures which take the inter-scale correlations into account, specifically multiple regression analysis.

Stepwise multiple regression was adopted as the primary analytical tool because of the opportunities it affords to specify the order of entry of particular variables (or variable sets) into an analysis, thus permitting the control of variance attributable to potentially confounding variables which are temporally or conceptually "prior" to an individual variable (or set of variables) of particular interest. Such a procedure also permits the researcher to estimate each variable or set's importance relative to other variables which have entered the stepwise analysis, and to estimate each variable or set's "unique" contribution to the prediction of attrition status while controlling for all other variables.

Attrition status (stayer or voluntary leaver) was dummy coded and used as the criterion variable in a series of stepwise multiple regression analyses. The independent measures were the 34 variables listed earlier and comprising three variable sets: pre-matriculation characteristics (21 measures); academic integration variables (6 measures); and social integration variables (7 measures).

In addition, previous attrition research (Spady, 1971; Astin, 1975) has suggested the possibility of important interactions associated with a student's sex, racial or ethnic origin, and program of study. Consequently, 42 interaction vectors were created as independent variables by cross-multiplying a respondent's "scores" on the presumably interacting variables. The interaction vectors created were: sex and each of the 13 academic and social integration variables, plus combined SAT scores; racial or ethnic origin (minority or non-minority) and each of the 13 integration variables, plus combined SAT scores; and major program of study (liberal arts or professional) and each of the 13 integration variables, plus combined SAT scores.

Because of the concern in this study with identifying those variables which are the best predictors of attrition, and because of the instability of regression weights, a preliminary, double cross-validation analysis, as recommended by Kerlinger and Pedhazur (1973, pp. 282-284), was performed. For this analysis the 528 respondents were divided randomly into two groups of equal size. A regression equation was derived on one sub-sample and then used to predict the attrition group membership of the second sub-sample of respondents. The procedure was then reversed. The actual and predicted group membership within each sub-sample were then correlated to derive two indices of the stability of the equation to be derived in an analysis of all respondents combined (presuming the cross-validation results indicated relative stability in the two equations derived initially).

In the main analases, done on all 528 respondents, three stepwise multiple regressions were performed: 1) pre-matriculation characteristics were entered first as a set, followed in order by the social integration set and the academic integration set; 2) like the first analysis, pre-matriculation variables were entered first as a set, but the order of entry of the social and academic integration sets was reversed; 3) pre-matriculation characteristics were entered first as a set, followed by the social and academic integration variables as

a combined set, all prior to the entry of the interaction vectors as a set.

RESULTS

The factor analyses of students' ARS ratings of their expected academic program and expected non-academic life yielded, in both instances, five factors with eigenvalues greater than 1.0. The factor analyses of students' actual perceptions of their academic program and non-academic life also yielded five-factor structures in each case. Because the factor structures of the pre- and post-registration responses were almost identical, and because the pre-registration structures were based on a larger sample than the post-registration ones (n = 766 v. n = 528), the pre-registration loadings were, consequently likely to be more stable and, thus, were used in the computation of factor scale scores for both pre- and post-matriculation responses.

The composition of the factor structures for the two statements are given in Table 1. Each factor has been given a tentative name which was felt to represent the underlying construct tapped. The reader is cautioned, however, against attributing surplus meaning to the factors beyond the items which comprise them.

INSERT TABLE 1 ABOUT HERE

Table 1 also shows the alpha, or internal consistency reliability, coefficients computed for each set of factor scales, as well as the percentage of explained variance accounted for by each factor after varimax rotation. Because the fifth factor for each analysis had an alpha coefficient of less than .70, these two factors were dropped from all further analyses as insufficently reliable. (The intermediate results for these and subsequent analyses are available from the authors upon request.)

Table 2 displays the structure of the two rotated factors with eigenvalues greater than 1.0 that emerged from the principal components analysis of the eleven

INSERT TABLE 2 ABOUT HERE

"self-perceived progress" items. The table also reports the alpha coefficients and percentage of variance explained by each factor after rotation.

Table 3 arrays the means, standard deviations, univariate F-ratios, and zero-order correlations with attrition status of all variables excepting those for sex, program of study, racial or ethnic origin (because of their categorical nature), and all interaction vectors (because of their uninterpretability). A

INSERT TABLE 3 ABOUT HERE

preliminary multivariate analysis of variance using the variables in Table 3 yielded an F-ratio of 2.93 (d.f. = 31/497), which was significant at $p<.001$ and indicated that subsequent analyses, outlined earlier, were warranted.

The first portion of the preliminary double cross-validation yielded a multiple R of .640 and an R^2 of .410; the multivariate F-ratio associated with this R^2 was 1.71 (d.f. = 76/187, $p<.001$). (This equation, based on the raw scores of the first of two sub-samples of respondents, had pre-matriculation characteristics entering first, followed by academic and social integration variables as a combined set, and then all interaction vectors as a set.) Following the prediction of attrition group status of the second sub-sample members using the regression weights and constant generated in this first regression, the actual and predicted group membership of the second sub-sample were found to correlate .539, with $r^2 = .290$.

The procedure was then reversed. The regression based on the raw scores of the second sub-sample produced a multiple of R of .601, with R^2 equal to .361. The multivariate F-ratio from this analysis was 1.39 (d.f. = 76/187), significant at $p<.025$. This equation was then used to predict attrition status for the first sub-sample of respondents; the actual and predicted status of the first sub-sample subjects correlated .481, with r^2 equal to .231.

Since both regressions were statistically significant the the r^2 associated with each in the double cross-validation was of acceptable size (by comparison with other research (Spady, 1971; Astin, 1975)), it was decided to proceed with the main analyses designed to answer the research questions posed earlier in this paper.

The overall multiple regression, using all 528 subjects and all variables and interaction vectors, produced a multiple R of .506, with an associated R^2 of .256 and a multivariate F-ratio of 2.05 (d.f. = 76/451), significant at $p < .001$. Table 4 offers a summary of the amount of variance in attrition status explained by the four major sets of variables.

INSERT TABLE 4 ABOUT HERE

As Table 4 indicates, pre-matriculation characteristics explained less than 4 per cent of the variance in attrition status, a statistically non-significant amount. Can certain pre-matriculation information on entering freshmen be used to predict voluntary attrition at the end of the freshmen year? The results of this study indicate that it cannot.

Table 4 also indicates, however, that the social integration variables, as a set, explained approximately 3 per cent of the variance in attrition status when pre-registration characteristics and academic integration variables were controlled. These results suggest that after taking initial differences and integration in the academic domain into account, such considerations as students' perceptions of their non-academic lives, the frequency of their informal contact with faculty members, the number of extra-curricular activities in which they engage, and the amount of progress they feel they have made in their personal development are modestly, but significantly ($p < .05$), related to the decision to remain or withdraw from this particular institution at the end of the freshman year.

Table 4 suggests, further, that the degree of integration in the academic systems of the university, after all pre-matriculation characteristics and social integration variables have been controlled, is also statistically related to attrition decisions. The academic integration variables (perceptions of the academic program, cumulative grade-point average, and perceived progress in intellectual development)--as a set--explained nearly 6 per cent of the variation in attrition status, nearly twice as much as the social integration set, and statistically significant at the .001 level.

Finally, Table 4 shows that the 42 interaction vectors, taken as a set, made a significant contribution ($p < .05$) to the prediction of attrition status, even after pre-matriculation characteristics and academic and social integration measures had been controlled. Indeed, as a set, the interaction terms explained an additional 10.6 per cent of the variance, nearly twice as much as the academic integration set and more than three times as much as the social integration measures. The fact that the overall set of interactions contribute significantly to the explanation of attrition status warranted investigation of individual interactions.

Table 5 arrays the stepwise and unique contribution of each variable and of those interaction terms which made significant stepwise and unique contributions. The stepwise contribution reflects the proportion of variance explained by a given variable upon entry, that is, while controlling for those variables which have already entered the analysis (reflected in a lower step number). Thus, for example, the stepwise contribution of the affective appeal factor of students' ratings of their academic program (step no. 2) explained 6.1 per cent of the variance in attrition status after all pre-matriculation characteristics (step no. 1), but no other variables, had been controlled. The unique contribution, on the other hand, represents the proportion of variance a given variable explains after <u>all</u> other variables (excepting the interactions) have been controlled. Thus, the affective appeal factor (academic program) explained

1.6 per cent of the variance unaccounted for by pre-matriculation characteristics and every other academic or social integration variable.

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INSERT TABLE 5 ABOUT HERE

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Examination of Table 5, focusing primarily on the unique contribution of each variable, indicates that the amount of informal contact with faculty members outside the classroom for ten minutes or more makes the largest contribution to the prediction of attrition. This variable is followed closely by the amount of affective appeal and amount of dullness that students find in their academic programs. No other single variable made a significant unique contribution to the prediction of attrition. (It is interesting to note that while the zero-order correlation between attrition status and dullness in the academic program was small (-.04), dullness nonetheless explains a significant proportion of the variance.)

After all other variables have been controlled, stayers, as compared with leavers, report more frequent contact with faculty members; find their academic program more "exciting," "enjoyable," enlightening," "stimulating," "different," and "provocative;" and report that their academic program is less "boring," "dull," or "irrelevant."

The analyses reported in Table 5 also suggest, however, that four interactions make statistically significant unique contributions to prediction: racial or ethnic origin and the affective appeal of the academic program ($p<.05$); racial or ethnic origin and the amount of progress in intellectual development ($p<.05$); sex and the amount of challenge in the academic program ($p<.01$); and program of study and the number of extra-curricular activities engaged in ($p<.05$). The unique variance attributable to these four interaction represents nearly one-third of the variance explained by all 42 interaction terms, after all "main

effects" variables have been controlled.

Figure 1 displays graphically the means for each of the four interactions making significant unique contributions. In Figure 1-a, the amount of self-perceived progress in intellectual development is virtually unrelated to attrition among minority students, but much more important among non-minority students. The more progress a non-minority student believes he or she has made in intellectual development, the less likely is that student to drop out after the freshman year.

With respect to the interaction of race or ethnic origin and the amount of affective appeal found in the academic program, however, Figure 1-b indicates not only that the less strongly the academic program touches the affective or emotional lives of students, the higher the probability that they will drop out, but also that the influence of these perceptions is likely to be stronger among minority students than among non-minority students. (Recall that because of the scale used in the ARS, a lower score reflects "more" of a given dimension.)

Figure 1-c indicates that the amount of challenge that males find in their academic progress is unrelated to subsequent attrition decisions, but females who find their academic programs less challenging than other females are more likely to leave the institution.

As suggested in Figure 1-d, students enrolled in professional programs of study (as opposed to those enrolled in the liberal arts) engage in more extra-curricular activities, but there is no relationship between attrition and the number of such activities in which professional program students engage. Among liberal arts freshmen, however, involvement in a number of extra-curricular activities is more likely to be characteristic of stayers than of voluntary leavers.

DISCUSSION

This study sought to test Tinto's (1975) theory of college student attrition, which views dropping out as a longitudinal process involving a complex series of

interactions between the characteristics of the student and the social and academic systems of the institution he or she attends. Specifically, this study sought to assess the relative importance in the attrition process of 1) students' background characteristics, 2) levels of both academic and social integration, and 3) the interaction of sex, program of study, and racial or ethnic origin with academic and social integration variables.

The analyses reported here strongly indicate that what happens to a student after matriculation is probably more important to subsequent attrition decisions than are the attributes the student brings to college. A considerable variety of pre-college traits (including sex, academic aptitude, personality, high school achievement, and other indicators identified in the attrition research literature as being associated with dropping out) were found to explain less than 4 per cent of the variation in attrition status--a non-significant amount.

Moreover, while Tinto's model theorizes that social and academic integration are approximately equally important in students' attrition decisions, the results of this study suggest that academic integration may be more important than social integration. The academic integration measures in this study explained 5.6 per cent of the variance in attrition status (after controlling for pre-matriculation characteristics and social integration variables), nearly twice as much as the social integration set, which explained 3 per cent of the variance, after controlling for pre-college traits and the academic integration indicators.

When the two sets were combined, the frequency of a student's informal interaction with faculty members made the largest unique contribution to the explained variance (2.2%), followed by the amount of affective appeal the student reported in the academic program (1.6%), and the amount of dullness found in the academic program (1.1%)--all statistically significant unique contributions. Compared with voluntary leavers, stayers reported more informal contact with faculty and found more affective or emotional appeal and less dullness in their academic programs.

While Tinto (1975) acknowledges that interaction with faculty may influence both social and academic integration, he nonetheless places such contact in the social realm of his model and it was treated accordingly in this study. But its primacy as a unique contributor to the prediction of attrition status, and evidence suggesting it is more closed aligned with academic variables than with social ones (median $|r|$ = .07 for the academic measures and .045 with the social indicators), suggest that the amount of variance attributable to academic integration variables would have been larger than it is in this study (and the proportion explained by the social set reduced) had faculty interaction been treated here as an indicator of academic integration.

Perhaps even more important, the findings of this study suggest that the academic and social correlates of attrition may be different for different kinds of people. Taken as a set, the forty-two interaction vectors created in this study explained 10.6 per cent of the variance in attrition status after controlling for all other variables. This percentage is nearly twice that attributable to the academic integration set, and more than three times the proportion explained by the social integration measures. Only 4 of the 42 interaction terms made significant unique contributions, but together they contribute 31 per cent of the variance explained by all the interactions and more than the social integration set as a whole.

It is interesting to note, also, that three of the four significant and unique contributions deriving from interactions involve academic dimensions: racial or ethnic origin and perceived intellectual progress; racial or ethnic origin and amount of affective appeal found in the academic program; and sex and amount of challenge in the academic program. These interaction terms, considered with the other three primary contributors to attrition prediction (amount of contact with faculty, affective appeal of the academic program, and dullness of the academic program) suggest not only that the academic domain may be the most

influential in attrition decisions, and that this influence may be different for different kinds of students, but also that the intrinsic or personal rewards students derive from their academic lives may be more important in attrition decisions than extrinsic rewards. Neither cumulative grade-point average nor the number of extra-curricular activities (assuming the rewards associated with such participation are at least as extrinsic as intrinsic) made either stepwise or unique contributions to the explanation of variance.

These results have several implications for both researchers and administrators concerned with the sources of attrition among college students. First, despite the importance given to pre-college characteristics in the conceptual models of both Spady (1970, 1971) and Tinto (1975), there appears to be little future in trying to predict attrition on the basis of such characteristics. There may, to be sure, be other background variables not employed in this study which might be useful, but the authors do not believe any such measures will add substantially to predictive capabilities. It will be important in future research to control initial differences between leavers and stayers, but in and of themselves, pre-college characteristics appear, at least in this study, to have little utility for explaining subsequent attrition.

Second, issues relating to students' academic lives--their integration into the academic systems and perhaps the kinds of rewards they find there--appear to be more important in attrition than is their integration into institutional social systems. It is possible, of course, that the opportunities and mechanisms for facilitating the assimilation of freshmen into this institution's social systems are adequate, yielding rewards sufficient to make social maladaptation an insignificant factor in freshman attrition at this particular university. Moreover, the opportunities for, and nature of, peer group interactions (addressed only indirectly in this study) may be important considerations in students' dropout decisions,

important enough to be equivalent in their influence to academic matters, as Tinto theorizes. Whether this equlity obtains across institutions, however, can be ascertained only through similar research on other campuses.

Third, within Tinto's model, the validity of the conceptual role assigned student-faculty informal interaction is cloudy at best. While Tinto places such contact specifically within the social domain, he acknowledges that such interaction probably influences both social and academic integration. The present study identifies such interaction as a key predictor of attrition, but the nature of its contribution needs to be clarified. The model (and our understanding of attrition) may profit from a specification of the kinds and contexts of such interaction (perhaps with each type and setting assigned to appropriate portions of the model). Pascarella and Terenzini (1977) report evidence indicating that not all types of faculty-student contact are equally important in their influence on students' attrition decisions, and analysis of how these varieties of contacts relate to social and academic integration may be very revealing.

Fourth, if the work of Spady (1970, 1971) and Tinto (1975) left any doubt that attrition is a complex phenomenon, this study should lay such doubts to rest. The results suggest not only that the correlates of attrition may be different for different people, but also that such interactions may be even more important than any other set of variables. It should be clear that univariate designs and statistical procedures may conceal more than they reveal about attrition; but even multivariate designs will have to take possible interactions into account.

Finally, the amount of variation in attrition status explainable in this study, on the basis of 34 single variables and 42 interaction vectors comprising four variable sets, is modest (25.6%). While this percentage is consistent with that reported in other studies, and while this study may have identified possible sources of that variation more clearly than have earlier studies, it should be

evident that we are still a long way from "explaining" why some students drop out and others do not. Tinto's model appears to be a conceptually useful tool for advancing our knowledge of attrition, but it seems equally clear that the model needs to be tested by subsequent studies in different settings and to be refined on the basis of those studies.

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TABLE 1

VARIMAX ROTATED FACTOR LOADINGS FOR
STUDENTS' ADJECTIVE RATING SCALE RESPONSES*

I EXPECT/HAVE FOUND MY ACADEMIC PROGRAM AT S.U. TO BE:		I EXPECT/HAVE FOUND MY NON-ACADEMIC LIFE AT S.U. TO BE:	
FACTOR	LOADING	FACTOR	LOADING
AFFECTIVE APPEAL		AFFECTIVE APPEAL	
Exciting	.78	Exciting	.77
Enjoyable	.76	Enjoyable	.75
Enlightening	.69	Good	.72
Stimulating	.59	Interesting	.65
Different	.56	Stimulating	.64
Provocative	.40	Enlightening	.58
Alpha Reliability = .83		Alpha Reliability = .94	
% Variance = 13.52%		% Variance = 17.98%	
PRACTICAL VALUE		PRACTICAL VALUE	
Valuable	.73	Relevant	.66
Worthwhile	.65	Practical	.66
Practical	.64	Valuable	.61
Necessary	.60	Worthwhile	.59
Informative	.55	Informative	.57
Relevant	.52	Necessary	.47
Good	.42	Alpha Reliability = .90	
Alpha Reliability = .92		% Variance = 12.95%	
% Variance = 13.8%		DULLNESS	
DULLNESS		Boring	.80
Boring	.80	Dull	.75
Dull	.72	Irrelevant	.58
Irrelevant	.64	Alpha Reliability = .98	
Alpha Reliability = .80		% Variance = 8.41%	
% Variance = 9.71%		CHALLENGE	
CHALLENGE		Demanding	.76
Difficult	.82	Challenging	.69
Demanding	.79	Difficult	.66
Challenging	.67	Alpha Reliability = .84	
Alpha Reliability = .87		% Variance = 8.12%	
% Variance = 8.1%		NEGATIVE ELEMENTS	
NEGATIVE ELEMENTS		Useless	.79
A Waste	.73	A Waste	.70
Useless	.72	General	.56
General	.47	Alpha Reliability = .63	
Alpha Reliability = .67		% Variance = 7.61%	
% Variance = 6.59%			
Total Variance Explained = 51.7%		Total Variance Explained = 55.1%	

*The complete factor matrix and related information are available upon request.

TABLE 2

VARIMAX ROTATED FACTOR LOADINGS FOR
STUDENTS' DEVELOPMENTAL PROGRESS SCALES

FACTOR/ITEMS	LOADING	ALPHA RELIABILITY	% VARIENCE EXPLAINED (ROTATED)
I. Personal Development/Progress		.80	28.4%
Clearer/Better understanding of self	.78		
Developing interpersonal skills	.74		
Interest/Openness to new ideas	.66		
Sense of self-reliance/discipline	.63		
Clearer idea of career goals and plans	.63		
Learning how to learn	.58		
Developing oral/written skills	.54		
II. Intellectual Development/Progress		.74	22.9%
Apply abstractions/principles in problem solving	.77		
Critical evaluation of ideas	.74		
Gaining factual knowledge	.73		
Learning fundamental principles, generalizations, theories	.66		
Total Variance Explained			51.3%

TABLE 3

DESCRIPTIVE STATISTICS, UNIVARIATE AND MULTIVARIATE F-RATIOS, AND ZERO-ORDER CORRELATIONS FOR CONTINUOUS PREDICTOR VARIABLES[a]

VARIABLE	STAYERS (N=438) Mean	SD	LEAVERS (N=90) Mean	SD	UNIVARIATE F RATIO[b]	ZERO-ORDER r WITH ATTRITION STATUS[c]
PRE-ENROLLMENT CHARACTERISTICS						
High School Rank in Class/Class Size	.24	.17	.25	.19	0.30	.02
Combined SAT scores	1041	136	1013	113	1.49	-.05
Mother's education level	4.11	1.19	4.07	1.36	0.11	-.01
Father's education level	4.54	1.38	4.51	1.38	0.03	-.01
Achievement Orientation (AI)	24.75	8.57	22.87	8.05	3.70	-.08
Dependency Needs (AI)	38.90	6.13	37.98	6.17	1.66	-.06
Emotional Expression (AI)	31.94	9.58	31.79	8.45	0.02	-.00
Educability (AI)	27.91	7.49	26.10	7.09	4.45*	-.09
COLLEGE EXPECTATIONS						
Frequency of informal interaction with faculty/month	5.03	6.08	3.94	5.72	2.41	-.07
Number of student activities	2.66	4.31	1.92	1.78	2.56	-.07
Affective Appeal (Acad.Prog.)	2.02	.47	2.06	.55	0.60	.03
Dullness (Acad.Prog.)	3.65	.44	3.63	.45	0.30	-.02
Practical Appeal (Acad.Prog.)	1.65	.38	1.70	.43	1.83	.05
Challenge (Acad.Prog)	2.12	.52	2.09	.52	0.35	-.02
Affective Appeal (Non-Acad.Life)	1.79	.46	1.90	.53	3.88*	.09
Challenge (Non-Acad.Life)	2.89	.52	2.87	.67	0.23	-.01
Practical Appeal (Non-Acad.Life)	1.98	.45	2.03	.51	3.25	.08
Dullness (Non-Acad.Life)	3.73	.36	3.68	.36	1.47	-.05
SOCIAL INTEGRATION VARIABLES						
Affective Appeal (Non-Acad.Life)	1.98	.69	2.25	.76	10.84**	.14
Challenge (Non-Acad.Life)	2.86	.75	2.90	.69	0.28	.02
Practical Appeal (Non-Acad.Life)	1.99	.62	2.22	.69	10.17**	.14
Dullness (Non-Acad.Life)	3.49	.64	3.37	.61	2.69	-.07
Frequency of informal interaction with faculty	10.74	12.30	4.40	3.78	23.45***	-.21
Number of Student Activities	1.84	3.71	1.42	3.87	0.92	-.04
Personal Development/Progress	3.11	.58	2.92	.64	8.13**	-.12
ACADEMIC INTEGRATION VARIABLES						
Affective Appeal (Acad.Prog)	2.55	.49	2.91	.55	38.50***	.26
Dullness (Acad.Prog.)	3.26	.52	3.20	.50	1.31	-.04
Practical Appeal (Acad.Prog.)	2.25	.53	2.56	.58	25.03***	.21
Challenge (Acad.Prog.)	2.36	.62	2.54	.70	6.78*	.11
Intellectual Development/Progress	3.08	.55	2.82	.61	15.31***	-.17
Cumulative Freshman GPA	2.78	.64	2.59	.74	6.11*	-.10

[a]Multivariate F-ratio=2.93 with 31 and 497 degrees of freedom ($p<.001$)

[b]Univariate degrees of freedom=1 and 527

[c]Attrition status scored: Stayers=0; Leavers=1

*$p<.05$ **$p<.01$ ***$p<.001$

TABLE 4

VARIANCE IN ATTRITION STATUS EXPLAINED BY DIFFERENT VARIABLE SETS

SOURCE OF VARIANCE	PROPORTION OF VARIANCE EXPLAINED[a]	DEGREES OF FREEDOM	F RATIO
Pre-Matriculation Characteristics	.03676	21	1.06
Social Integration Variables (Controlling for student pre-matriculation characteristics and academic integration variables)	.03022	7	2.618*
Academic Integration Variables (Controlling for student pre-matriculation characteristics and social integration variables)	.05611	6	5.671**
Interactions (Controlling for pre-matriculation characteristics, academic and social integration variables)	.1060	42	1.53*
Error	.74369	451	

[a]Variance proportions do not sum to 1.00 because of adjustments among variable sets.

*$p < .05$ **$p < .001$

TABLE 5

STEPWISE AND UNIQUE CONTRIBUTIONS OF INDIVIDUAL VARIABLES

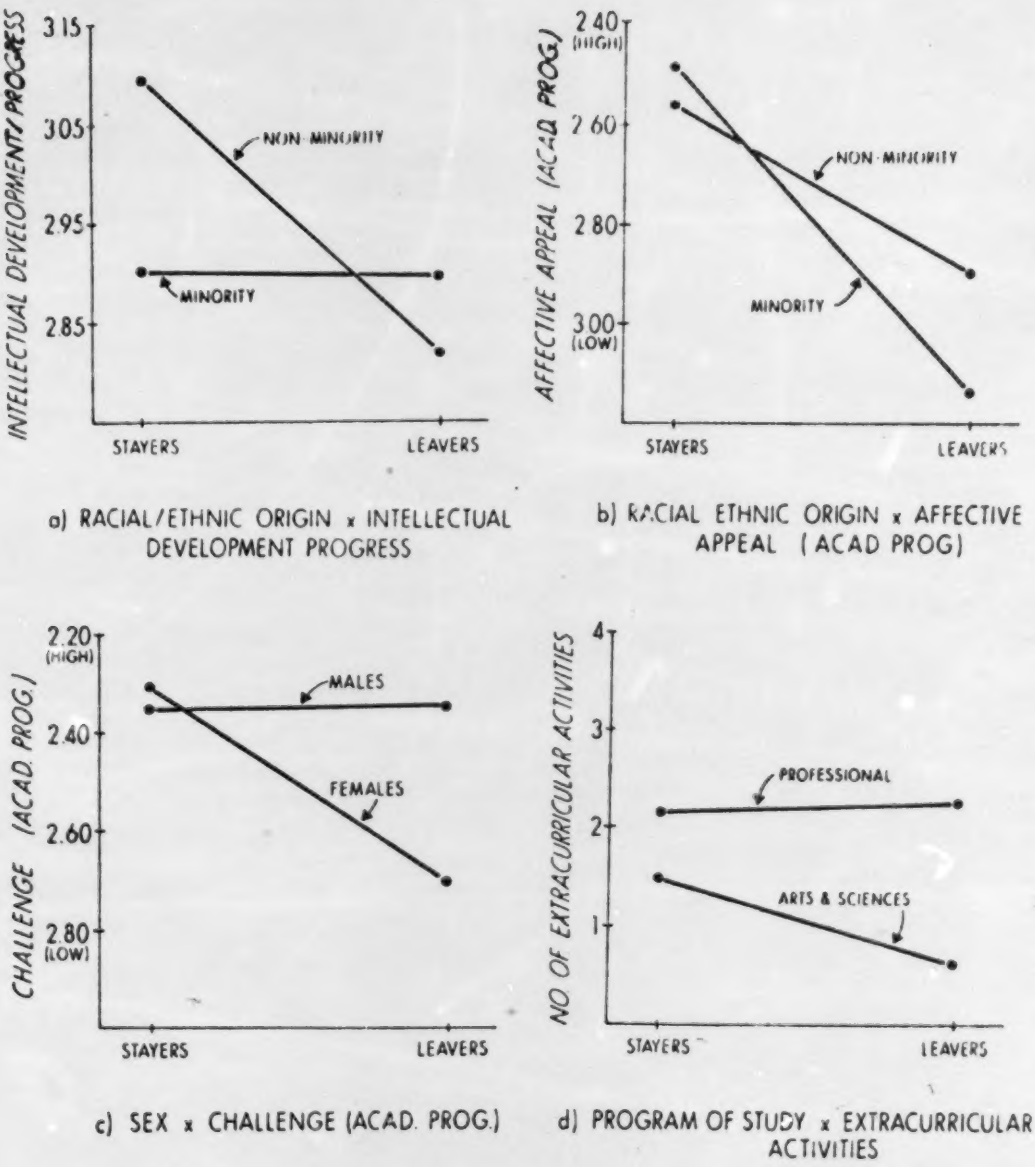
STEP	VARIABLE	STEPWISE CONTRIBUTION PROPORTION OF VARIANCE	STEPWISE CONTRIBUTION F RATIO	UNIQUE CONTRIBUTION[a] PROPORTION OF VARIANCE	UNIQUE CONTRIBUTION[a] F RATIO
1.	Pre-Enrollment Characteristics(Set)	.03676	1.06	.03676	1.06
	ACADEMIC AND SOCIAL INTEGRATION VARIABLES				
2.	Affective Appeal (Acad.Prog.)	.06086	36.91***	.01658	10.05**
3.	Interaction with faculty	.02658	16.12***	.02221	13.47***
4.	Dullness (Acad.Prog.)	.01175	7.13**	.01138	6.90**
5.	Affective Appeal (Non-Acad.Life)	.00465	2.82	.00108	0.65
6.	Grade-Point Average	.00400	2.42	.00342	2.07
7.	Practical Appeal (Acad.Prog)	.00244	1.48	.00232	1.40
8.	Challenge (Acad.Prog.)	.00122	0.74	.00120	0.73
9.	Dullness (Non-Acad.Life)	.00077	0.47	.00068	0.41
10.	Practical Appeal (Non-Acad Life)	.00037	0.22	.00034	0.21
11.	Personal Development/Progress	.00026	0.16	.00017	0.10
12.	Intellectual Development/Progress	.00035	0.21	.00034	0.20
13.	Extracurricular Activities	.00018	0.11	.00016	0.10
14.	Challenge (Non-Acad.Life)	.00014	0.09	.00014	0.09
	Academic and Social Total[b]	.11356	5.74***		
	INTERACTIONS				
15.	Program of Study x Affective Appeal (Acad.Prog.)	.02896	17.57***	.00453	2.75
16.	Racial/Ethnic Origin x Affective Appeal (Acad.Prog.)	.01085	6.58*	.00700	4.24*
17.	Sex x Challenge (Acad.Prog.)	.01149	6.97**	.01139	6.91**
18.	Racial/Ethnic Origin x Intellectual Development/Progress	.00825	5.00*	.00748	4.54*
19.	Program of Study x Extracurricular Activities	.00791	4.80*	.00702	4.26*
	Interactions Total[c]	.1060	1.53*		

[a]Degrees of freedom=1 and 451

[b]Controlling for Pre-enrollment characteristics (df= 13 and 451)

[c]Controlling for Pre-enrollment characteristics, social and academic integration variables (df=42 and 451)

*p<.05 **p<.01 ***p<.001



a) RACIAL/ETHNIC ORIGIN x INTELLECTUAL DEVELOPMENT PROGRESS

b) RACIAL ETHNIC ORIGIN x AFFECTIVE APPEAL (ACAD PROG)

c) SEX x CHALLENGE (ACAD. PROG.)

d) PROGRAM OF STUDY x EXTRACURRICULAR ACTIVITIES

Fig. 1. Group means for four interactions making significant unique contributions to prediction of attrition status.